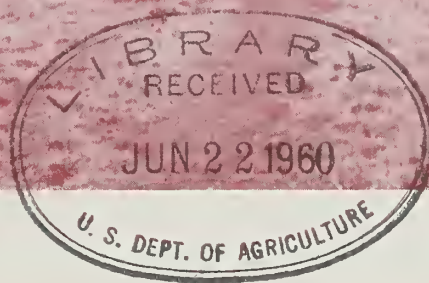


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# RESEARCH at the SAN JOAQUIN EXPERIMENTAL RANGE

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# THE SAN JOAQUIN EXPERIMENTAL RANGE

## A Typical 4,600-Acre Area of Annual-Type Foothill Range

Established in 1935 by the U. S. Department of Agriculture, Forest Service, and since operated by the Pacific Southwest Forest and Range Experiment Station for research. Used by the University of California from date of establishment until June 1958 as a principal location for animal husbandry research.

Elevation: 700 to 1,700 feet.

Climate--Mediterranean; mild, wet winters--hot, dry summers.

Rainfall: 10 to 32 inches per year. Long-time average, 19.5 inches.

Plant growth--grazing seasons:

Inadequate green forage season--mid-October through January.

Adequate green forage season--February into June.

Dry forage season--early June into October.

Principal range forage species:

Soft chess (Bromus mollis)

Foxtail fescue (Fescue megalura)

Broadleaf filaree (Erodium botrys)

Clover (Trifolium spp.)

Range herbage production: 600 to 2,800 pounds per grazable acre. Long-time average 1,650 pounds per acre.

Soil: Vista sandy loam.

Principal woody plants:

Blue oak (Quercus douglasii)

Interior live oak (Quercus wislizenii)

Digger pine (Pinus sabiniana)

Wedgeleaf ceanothus (Ceanothus cuneatus)



## PAST RESEARCH

Research in one or more broad fields has been continuously underway since establishment of the Experimental Range in 1935. Many worthwhile findings applicable to foothill annual type ranges have resulted from this program.

### IN RANGE GRAZING . . .

it has been determined and demonstrated that an average stocking rate of about 25 acres per breeding cow and calf yearlong will sustain both range and livestock production at a higher level without detriment to the resource than will either heavier or lighter stocking. Herbage utilization standards have been developed to guide range use to this conservative level.

### IN BRUSHLAND CONVERSION . . .

a five-step procedure for changing the cover from brush to grass has been developed and tested.

1. Select suitable areas with moderate gradient, good soil, and good herbage production potential, prepare the brush for burning by crushing, fell undesirable trees, and clear fire control lines.
2. Remove the brush by safe burning at the proper time, that is, when crushed brush will burn readily and standing brush will not.
3. Plant seed of adapted forage species in the clean seed bed. It is best, where possible, to use a heavy-duty drill and a recommended mixture of annual and perennial seed.
4. Control brush seedlings and sprouts. Spray with a selective hormone-type chemical that does not injure the grass. A reburn of dry grass will kill brush seedlings but not the sprouts.
5. Maintain a good stand of seeded species by regulating such factors as intensity and season of grazing use to promote vigorous growth and assure good soil cover.

Benefits of conversion from brush to grass on suitable sites are:

1. More grazing for livestock.
2. Better watershed cover.
3. Better habitat for wildlife.
4. Easier access for hunters and fire fighters.
5. Easier and safer fire suppression.



Breeding herds thrive on properly stocked annual-type ranges.

5 years after burn,  
no follow-up.

Burn plus 3 years chemical control.



40% more herbage per grazable acre.  
97% fewer brush plants.  
140% more grazing capacity.



## PAST RESEARCH

### IN RANGE FERTILIZATION . . .

it has been found that 60 pounds of sulfur per acre applied every third year will economically increase the amount and quality of grazable range herbage, range grazing capacity, and cattle weight gains. Gypsum is a low-cost source of sulfur. The initial application increases legume growth and production. Nitrogen added to the soil by the legumes increases grass growth and production during the next two years. In one 9-year trial, herbage production and livestock weight gains were increased 50 percent through sulfur fertilization. Sulfur fertilized range produces more herbage of higher quality than unfertilized range.

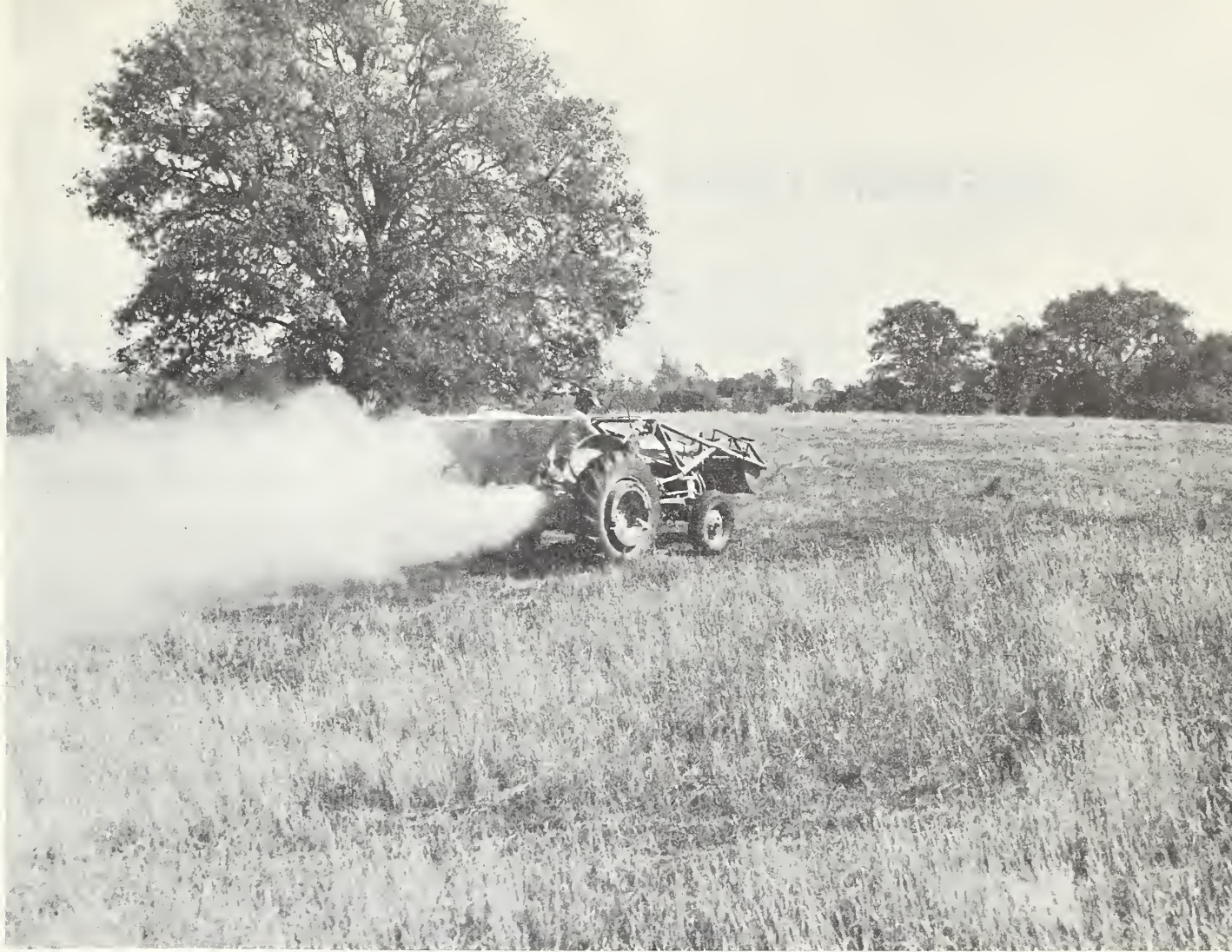
### IN RANGE RESEEDING . . .

it has been found that only the best sites and deepest soils can be improved. This requires seedbed preparation, selection of adapted species (perennials in the best rainfall areas; annuals in the drier areas) and careful management after establishment. Proper grazing management and fertilization of resident annual plants offer more promise for range improvement than does artificial reseeding on arid annual ranges.

### IN BEEF CATTLE HUSBANDRY . . .

major investigations designed to increase beef production through heavier calves and larger calf crops, high sustained growth of young animals, reduced losses, improved nutrition, and other good practices have been conducted by the Department of Animal Husbandry, University of California, Davis. This research contributed many worthwhile guides to more efficient production on annual-type foothill ranges.





Broadcasting gypsum on annual-type foothill range.

#### IN WILDLIFE RESEARCH . . .

life histories and interrelations with environment have been worked out for many animals. The U. S. Fish and Wildlife Service, the California Department of Fish and Game, and the University of California have conducted most of this research. Small animals such as ground squirrels, gophers, and kangaroo rats compete importantly with cattle for range herbage. Competition is greater in the green than in the dry season. A typical population of these animals could account for one-third of the range herbage produced yearly.

## RESEARCH TODAY

The current program is completely new. It is composed of three major lines of management research plus supporting and cooperative studies. The management research is designed to improve the use and management of foothill ranges regardless of ownership and location. This phase is expected to produce basic information on the effect of different grazing systems on range vegetation and cattle. Such information is needed for the development of a grazing management practice which will sustain high level production without deterioration of other land uses.

### IN GRAZING MANAGEMENT . . .

#### ON NATIVE RANGE:

Sixteen separate range areas, newly fenced, and 99 Hereford heifers constitute the basis for a long-time grazing management study. After two years of calibration, 1959-1960, repeated grazing by seasons will be applied to six areas. Six others will be grazed in rotation by seasons. The other four (two native and two gypsum-fertilized) will be grazed continuously yearlong.

Basic information will be obtained on herbage production, composition of vegetation, range utilization, range condition and trend in condition, cow and calf weights and performance by seasons, supplemental feeding, and other factors. This information will guide the development of an improved grazing system for annual-type ranges. Future high level production without deterioration of the resource depends upon the best possible management of every acre of annual foothill range.



## ON FERTILIZED RANGE:

Range fertilization in the annual type has recently become an accepted range improvement practice, but:

Under what conditions is it practical?

What are its benefits, advantages?

How should fertilized range be managed?

How does it best fit into a yearlong range livestock operation?

These are some of the questions we expect to answer by grazing management research on fertilized range. Twelve individual range areas and 80 head of Hereford yearlings constitute the basis for this research. Four areas are fertilized with gypsum, four with ammonium sulfate, and four held unfertilized. Two areas in each fertilizer treatment are grazed repeatedly during the green season and two during the dry season. The cattle are wintered in separate areas outside the experiment. They are turned off one set of study areas at the end of the green season, and a new group of animals starts simultaneously on each of the dry-season areas.

Uniform, high quality Hereford heifers  
used in grazing management research.





## RESEARCH TODAY

Information from this research--on herbage production, grazing capacity, and cattle performance--will form the basis for grazing practices applicable on fertilized foothill range. Promising seasonal grazing combinations will be tested before recommendations are issued.

### ON CONVERTED RANGE:

Conversion of brush to grass has become a widespread practice in the foothills along the up-hill side of the annual range type. Conversion procedures are well known, but management practices effective in keeping the brush out and grazing values up have not yet been determined. The current research in this field is expected to develop such a practice.

At the Clark Site, a 120-acre area of good grassland soil invaded by brush and located 15 miles northeast of the Experimental Range, methods of maintaining good grass range on converted brushland under grazing use are being studied. Chemical

Spraying for brush sprout and seeding control on converted range.





sprays are applied as needed and livestock grazing is manipulated to favor growth and production of range plants and to discourage reinvasion by brush.

### SUPPORTING ACTIVITIES . . .

Research procedure is determined by judgment, experience, and from other research. Supporting research conducted at the Experimental Range, worthwhile in its own right, will have a bearing on how future grazing management studies will be evaluated and to some extent on what treatments will be studied.

### TECHNIQUES RESEARCH:

Measurement of range vegetation, soil, and livestock constitute a complicated, difficult undertaking. The questions of what to measure and how to do it must be considered when research is planned and answered as early as possible thereafter.

How to measure vegetation is the subject of several active studies. The problem of how to best record and efficiently process large volumes of data on cattle and plants is being solved. These studies are an essential part of the over-all research program.

Studying range vegetation.





# RESEARCH TODAY

## SUPPORTING ACTIVITIES . . .

### COOPERATIVE RESEARCH:

When resources and know-how of more than one individual or research organization are brought to bear upon a problem, progress can be greater than if individuals or organizations tackled the problem separately.

At the San Joaquin Experimental Range, the Agricultural Research Service, U. S. Department of Agriculture, and the Agronomy Department, University of California, Davis, are co-operating with us in the study of sulfur fertilizer--its use by plants and loss from the soil by leaching. In another study, long-time effects of sulfur fertilization upon native and introduced legumes are being investigated. Also, different rates and combinations of nitrogen, phosphorus, and sulfur fertilizer are being tested for their effects upon herbage production, composition, and date of range readiness.

Lysimeters used to study amount and distribution of radio-active sulfur in plants, soils, and water.





## Our Livestock Cooperators

C. Dick Hansen--Biola, California

Mr. Hansen provides the Hereford heifers used in the management study on native range.

Dr. Norman F. Sprague, Jr.--Weldon, California

Dr. Sprague provides the yearlings used in the management study on fertilized range and bulls for breeding purposes.

James McDougald--O'Neals, California

Mr. McDougald provides the cattle used in the management study on converted range.

Elwin A. and George U. Roney--Chico, California

The Roneys provide bulls.

## Other Cooperators

Region 5, National Forest Administration

Sierra National Forest.

Sequoia National Forest.

Fresno State Agricultural College

California Division of Forestry

California Spray Chemical Corporation

Agricultural Research Service, USDA

University of California

## Our Advisory Board

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March 1960







